Coordination of Science Teaching.

Prof. Armstrong, F.R.S., took the chair at the afternoon meeting, when Dr. Kimmins read a paper on the coordination and delimitation of science teaching in various grades of schools. He maintained that the aim of rational methods of teaching science was not the acquisition of knowledge, but rather the training of the intelligence of the child and the development of certain mental qualities of the highest value. Useful knowledge had been and was still the curse of science teaching. He urged that the adoption of rational methods in science teaching simplified to a remarkable degree the relation and delimitations of such teaching, and instanced the coordination in workshop and laboratory instruction which has been so effectually secured in London schools. In the discussion which followed, Dr. Forsyth emphasised the need of a sound general education for all students who intended later to enter technical colleges.

During the afternoon, Canon Rawnsley read a paper at the Central Higher Grade School on the national import of co-education.

Elementary Experimental Science.

Prof. Smithells occupied the chair at the third meeting, when papers were read by Mr. French, on the teaching of experimental physics in its early stages, and by Mr. R. L. Taylor, on the similar teaching of experimental chemistry. Mr. French described and approved the methods of teaching elementary physics advocated by the British Association committee and now very generally adopted in secondary schools. Mr. Taylor attacked, in a friendly way, the heuristic method of teaching chemistry as advocated by Prof. Armstrong, an admirable method which, he said, had become an undesirable system. A lively debate ensued, in which many speakers, following Mr. Taylor's lead, appeared to strive to accentuate the abuses of the "research" method of teaching chemistry rather than to recognise its many advantages

Prof. Armstrong, in replying to Mr. Taylor's criticisms, said the question at issue was not merely a difference of opinion. There was a great principle at stake, and that principle was—Were they or were they not to train boys and girls at school to think for themselves, to reason for themselves, to do for themselves, to be thoughtful, observant human beings throughout the time they were at school, whenever they left school, and ever afterwards? The majority of the subjects that were taught and had been taught up to the present day had been taught in an academic, didactic and unpractical way. Britain was what it was because of the individuality of Britishers. Our modern school system was sapping our individuality. It was with the object of avoiding that loss of character that he and others were bringing practical methods into vogue.

Prof. Smithells, in a very able speech, summarised the discussion, and traced many of the improvements in the teaching of science in England during the last ten years to the advocacy by Prof. Armstrong of rational methods of teaching, but at the same time pointed out there were extravagances in some of Prof. Armstrong's utterances which were, perhaps, inseparable from the work of a pioneer.

At the Central Higher Grade School during the discussion on the heuristic method, Mr. Lomas read a paper on fitting up school laboratories.

The Teaching of Nature-Study.

The concluding meeting of the conference was presided over by Prof. Miall, F.R.S. A paper was read by Mr. H. Wager on the methods of nature-study, in which he urged that nature-study in its widest aspects should be regarded as the study of elementary natural science, and should include, in addition to the simple facts of botany, zoology and geology, so much of elementary physics and chemistry as was concerned with the study of air and water, the condensation of moisture, frost, snow, and other simple natural phenomena. The formal study of any branch of science was not implied in it, nor was it desirable, in the earlier stages, at any rate, that they should be restricted to one branch of science only. The main objects in advocating the inclusion of nature-study in schools were (1) to arouse an interest in natural objects and phenomena, and (2) to develop to some extent the scientific method of dealing with simple problems, by the careful observation and comparison of facts and drawing inferences from them.

Prof. Weiss afterwards suggested that some portion of public parks should be made available for nature-study. He disagreed with Mr. Wager, who had deprecated the employment of diagrams and museums, and said he could not but think that there were many objects from which lessons could usefully be learnt without having the living animal before them. They should first go to the living objects, but useful illustrations could be drawn from other countries, and where they had opportunities they should use them.

During the concluding afternoon, Mr. W. C. Fletcher, of Liverpool Institute, read a paper on the teaching of geometry, in which he generally supported the recommendations of the British Association committee.

The next conference will be held at Leeds.

A. T. S.

UNIVERSITY AND EDUCATIONAL INTELLIGENCE.

THE annual meeting of the Association of Science Masters in Public Schools will be held at the University of London on January 17.

WE learn from the *Times* that the Treasury has given its assent to the scheme by which Reading Corporation acquires the site and buildings of the University College at a cost of 50,000*l*. The college, in exchange, obtains a much larger site on the London Road, whereon it is intended to erect a handsome pile of college buildings.

FROM a letter which Sir Michael Foster has addressed to Sir John Rotton, it appears that an election of a new member for the University of London may not be necessary. This news will be received with great satisfaction by most of the electors, for the University has in Sir Michael Foster a representative of the high intellectual standard demanded of an academic constituency. Since expressing the wish to resign his seat, the circumstances which suggested that course have, most fortunately, changed, and he now desires to know whether the graduates wish him to remain their member or not.

CANDIDATES for the Andrew Carnegie research scholarships to be awarded by the Iron and Steel Institute must send in their applications, on a special form, before the end of February to the Secretary of the Institute, 28 Victoria Street, S.W. The object of this scheme of scholarships is not to facilitate ordinary collegiate studies, but to enable students, who have passed through a college curriculum or have been trained in industrial establishments, to conduct researches in the metallurgy of iron and steel and allied subjects, with the view of aiding its advance or its application to industry. There is no restriction as to the place of research which may be selected, whether university, technical school or works, provided it be properly equipped for the prosecution of metallurgical investigations. Last year the Andrew Carnegie gold medal was awarded to Dr. J. A. Mathews, New York, and scholarships, each of the value of 100*l*., were awarded to O. Boudouard, Paris; W. Campbell, New York; A. Campion, Coopers Hill; P. Longmuir, Manchester; E. Schott, Berlin; and F. H. Wigham, Wakefield.

PROF. ROBERTSON, the Canadian Commissioner of Agriculture and Dairying, recently made a visit of investigation and observation to a portion of the State of Ohio, where remarkable progress has been made in the improvement of rural schools by the plan known as that of consolidation. Instead of having a great number of small school districts, each with its own little school, these districts are united in one, and a large central school meets the needs of the whole area. The children are conveyed to and from the central school by means of vans at the expense of the rates. Prof. Robertson sums up some of the advantages afforded by the consolidation of rural schools and the free transportation of pupils. It results in the attendance of a larger number of the children in the locality, it brings about a more regular attendance of pupils of all grades of advancement, it ensures teachers of higher qualifications and longer experience in rural schools, it creates conditions for a proper classification of pupils and provides the beneficial influences of fairly large classes of pupils of about equal advancement. It makes it convenient for boys and girls in rural districts to obtain a high school education without leaving home, and leads to the erection of better school buildings and more satisfactory equipment. It makes it practicable for rural schools to teach nature-

study, manual training and household science, and for advanced pupils to obtain instruction in agriculture, horticulture and allied subjects. It stimulates public interest in the schools and brings to the pupils of a township an institution in which all can have an equal interest and a worthy pride.

THE address given by Sir J. Wolfe Barry on Tuesday, as president of the Association of Technical Institutions, contained several instructive comparisons as to the position of technical education at home and abroad. For instance, he pointed out that while the matriculated students in German technical high schools number 15,442, the number in the whole of similar institutions and universities of Great Britain is only 3873. But it is not so much the number of students as the spirit in which scientific knowledge is regarded that is of importance to national progress. What is wanted, Sir J. Wolfe Barry remarked, is, first, that the highest intellects among us for research as applied to the arts should be rendered available, and secondly, the best possible directing minds should be discovered and utilised in our manufactures. In other words, the man of science should be encouraged to help in the development of industries. Efforts should be made to ensure that industrial leaders are well equipped with scientific knowledge and the principles of technology, and in our schools less time should be given to dead languages and more to the efficient study of science, applied mathematics and other subjects demanded by modern life. Finally, everyone should endeavour, each in his own sphere of influence, to direct, without any exaggeration, but with profound conviction, the attention of our commercial classes to the fact that technical education of the best and most thorough kind is an urgent and crying necessity if we are to maintain a leading position among the nations of the world.

SOCIETIES AND ACADEMIES.

LONDON.

Royal Society, December 11, 1902.—"An Error in the Estimation of the Specific Gravity of the Blood by Hammerschlag's Method, when employed in connection with Hydrometers." By A. G. **Levy**, M.D. (London). Communicated by Sir Victor Horsley, F.R.S.

Hammerschlag's method may be briefly described as the adjustment of the specific gravity of a mixture of chloroform and benzol by small successive additions of either constituent until it corresponds to the specific gravity of the blood, the test of the attainment of this condition being that a small drop of the blood, when immersed in the mixture, shall remain suspended without any very obvious tendency to rise or sink. The specific gravity of the mixture is then estimated by means of a hydrometer.

This method is known to be liable to an error of varying magnitude. The investigation into the source of this error resolved itself into a series of observations upon the effect of the low value of the surface tension of the above mixture upon the readings of hydrometers immersed therein. The surface tension of the mixture may be taken as 2·75 mg. per mm., and that of clean tap water as 7·3 mg.

The readings of four different hydrometers when immersed in a mixture of the specific gravity 1·000 are appended :—

No. of hydrometer.	No. 1.	No. 2.	No. 3.	No. 4
Reading of scale in a chloroform benzol mixture of specific gravity = 1·000	1·002	1·003	1·0095	1·010

The author found, however, that the *calculatea* errors exceeded in each instance those *observed*, and the results are contrasted in the following table :—

Hydrometer.	Observed error.	Calculated error.
1	0·002	0·0035
2	0·003	0·0056
3	0·095	0·0123
4	0·010	0·0146

The difference was accounted for satisfactorily by an innate error demonstrated to exist in each hydrometer, evidently due to the standardisation of the instrument in unclean (*i.e.* greasy) water, which possesses a lower surface tension than 7·3 mg. This appears to be a common fault in hydrometers.

Chemical Society, December 17, 1902.—Prof. Emerson Reynolds, F.R.S., president, in the chair.—The following papers were read :—A reagent for the identification of carbamide and of certain other nitrogen compounds, by Mr. H. J. H **Fenton**. Among the derivatives of methyl-furfural previously described by the author is one which may be either methyl-furil or the isomeric ketone-aldehyde ; this in presence of a trace of acetyl chloride gives with carbamide and monoalkyl carbamides a brilliant blue colour.—The rate of decomposition of diazo-compounds, part ii., diazo-compounds of the naphthalene series, by Messrs. **Cain** and **Nicoll**. The reaction is monomolecular, but after a time is not strictly so owing to the formation of azo-colours.—State of carbon dioxide in aqueous solution, by Prof. J. **Walker**. It is shown that obedience to Ostwald's dilution law in the case of solutions of carbonic acid gas and similar substances affords no evidence as to the amount of real carbonic acid present in solution.—Qualitative separation of arsenic, antimony and tin, by Prof. J. **Walker**. The mixed sulphides are dissolved in soda solution and oxidised with sodium peroxide ; from the solution, stannic oxide is precipitated by boiling with ammonium chloride, whilst arsenic and antimony can be separated in the usual manner.—The hydrates and solubility of barium acetate, by Prof. **Walker** and Mr. W. A. **Fyffe**. The solubility curve consists of three portions, all convex to the axes and representing the solubilities of a trihydrate, monohydrate and anhydrous salt respectively.—*cis*- and *trans*-ββ Dimethylglutaric acid, and the separation of the *cis* and *trans* forms of substituted glutaric acids, by Messrs. J. F. **Thorpe** and W. J. **Young**.—Constitution of metallic cyanides, by J. E. **Marsh**. Metallic cyanides, with the exception of those of silver and mercury, are oxidised by permanganate to cyanates, whence the author concludes that in general these cyanides have the isonitrile structure, the exceptions being nitriles.—Auto-reduction of mercury and silver cyanides, by Messrs. **Marsh** and **Struthers**.—Note on the action of acids on cellulose, by Miss M. **Gostling**. The black residue formed when cellulose is heated with strong haloid acids closely resembles the artificial humus obtained by the action of dilute acids on sugars.—Nitrotartaric acid and some of its esters, by Prof. P. F. **Frankland**, Mr. H. L. **Heathcote** and Miss **Hartle**.—The nitration of diethylmonobenzoyl and mono-*p*-toluyl tartrates, by Prof. P. F. **Frankland** and Messrs. **Heathcote** and **Green**. A preliminary description of these derivatives of tartaric acid.—Interchange of halogen for hydroxyl in chloro- and bromo-naphthalenediazonium hydroxides, by Dr. **Orton**.—Purpurogallin, by Messrs. A. G. **Perkin** and A. B. **Steven**. A description of acyl and alkyl derivatives is given and the products of decomposition by potassium hydroxide are found to be two ketonic substances of the formula $C_{11}H_6O_5$.—Note on the destructive distillation of ethyl gallate, by Mr. A. G. **Perkin**. In addition to pyrogallol and ethyl alcohol, there is formed 7 per cent. of rufigallic acid ; the latter is also produced by the distillation of gallic acid itself.—A series of double chromates, by Mr. S. H. C. **Briggs**. A double salt of the composition $(NH_4)_2Ni(CrO_4)_2,6H_2O$ and a second of the composition $(NH_4)_2Ni(CrO_4)_2,2NH_3$ have been obtained, as well as the corresponding salts of copper, zinc and cadmium, by the action of ammonia on the appropriate dichromates.

Linnean Society, December 18, 1902.—Prof. Sydney H. Vines, F.R.S., president, in the chair.—Notes on some Copepoda from the Faröe Channel, by Mr. Thomas **Scott**. Waterlogged and partly decayed pieces of wood are frequently brought up in the dredge, and these fragments harbour Entomostraca. In this manner, some of the rare forms, commented on in this paper, were obtained. Three new species and a new variety of another previously characterised species were described.—The Amphipoda of the *Southern Cross* Antarctic expedition, with remarks on bipolarity, by Mr. A. O. **Walker**. The collection was made between Cape Adare in April, 1899, and Franklin Island in February, 1900, the larger part after the death of the zoologist of the expedition (Mr. N. Hanson) by Mr. Anton Fougner, partly by dredging. The species obtained have a striking resemblance to forms found in Arctic seas, though only one species has been deemed identical, *Ampelisca macrocephala*, Lilljeb. The author does not put forward any theory of his own to account for the similarity of forms in the Arctic and Antarctic regions with their absence from the intervening tropical seas, but he adduces many instances of it, especially the distribution of the genus Orchomenopsis, Sars, which is widely spread in waters of low temperature. One new genus, Oradarea, is described with a single species, from Cape Adare.